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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/088,403	11/11/2002	Andrew Jonathan Turberfield	480821.90116	2958

7590 06/29/2005

Quarles & Brady
411 East Wisconsin Avenue
Milwaukee, WI 53202-4497

EXAMINER	
CHEA, THORL	

ART UNIT	PAPER NUMBER
1752	

DATE MAILED: 06/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/088,403	TURBERFIELD ET AL.	
	Examiner	Art Unit	
	Thorl Chea	1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 31, 2005 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 99/09439 (WO'439) in combination with the applicants'disclosure on page 2, third paragraph; Journal of Vacuum Science & technology B, 1995, vol. 13, no. 6, 30012-3016 (Lee et al) Optics Letters, 1998, vol. 23, no. 22, 1745-1747 (Witzgall et al), and Patil et al (US Patent No. 5,907,333).

WO'439 discloses a method for forming a photonic crystal material having 3-D periodic structure comprising steps as claimed including the suggestion of the use of a high density of photochemically induced cross-linking that is rendered relatively insoluble and retained during development. See the WO'439 as a whole, and especially the abstract, claims 1-19 on pages 17-19, the negative photoresist, cross-linking material and conventional radical intitiators on pages 13, lines 18-30. The use of photosensitive layer having thickness of 50 and 100 microns in the

process for forming 3-D periodic structure within the scope 10 to 100 nm is exemplified in WO'439, on page 11, lines 14, 22.

The WO'439 fails to specifically disclose the photosensitive material possessing an average number of crosslinkable groups per mole at least 3 with an equivalent weight per crosslinkable group at most 1000. However, the claimed photosensitive material has been available in the art and has been used in the formation of 3-D structure. Note to the specification on page 2 lines 15-30 which disclosed that the glycidyl ether of bisphenol A novolac is available as EPON-SU-8 from Shell Chemical, and it has 8 epoxy group per molecule. Witzgall et al discloses the use SU-8 film in the process of forming a 3-D structure, and the after exposure, the film was developed by heating to 100 °C for 0.5 h (postbake). See document as a whole. Lee et al discloses the SU-8, a negative-tone photoresist consisting of EPON SU-8 resin from Shell Chemical and photosensitized with triaryl sulfonium salt, and the photoresist is subject to postbake to a 15 mn postbake on a hot plate for 90-95 °C. The amount of triaryl sulfonium sat is 5%. See page 3012, paragraph II. Patil et al disclose dysfunctional epoxy compound such as EPON-SU-8 and photoinitiator such as onium salt in column 4, lines 14-63. It also disclosed the use of thermal energy during or after exposure to radiation source to accelerate the hardening reaction in column 8, lines 25-30. It would have been obvious to the worker of ordinary skill in the art at the time the invention was made to a known photosensitive material such as cross-linking material suggested by WO'439 by a known photosensitive material disclosed in the applicant's disclosure, Lee et al, Witzgall et al or Patil et al in the process taught in the WO'439, and thereby provide a process and material as claimed. The triaryl sulfonium sat is considered as photoacid generator disclosed in Lee et al and Patil et al; the thickness of photosensitive layer

is disclosed in WO'439. The amount of photoinitiator in an amount from about 1.5 to about 5 weight % based on the total weight of the resin composition is also disclosed in Patil et al in column 4, lines 52-63.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-21 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 6,358,653 (Turberfield) in view of the applicants'disclosure on page 2, third paragraph; Journal of Vacuum Science & technology B, 1995, vol. 13, no. 6, 30012-3016 (Lee et al), Optics Letters, 1998, vol. 23, no. 22, 1745-1747 (Witzgall et al), and Patil et al (US Patent No. 5,907,333). The invention claimed in the '653 patent and that of the present claimed invention differs in the selection of the photosensitive, but the section of the crosslinkable photosensitive material would have been found prima facie obvious over the applicants'disclosure on page 2, third paragraph; Journal of Vacuum Science & technology B, 1995, vol. 13, no. 6, 30012-3016 (Lee et al), Optics Letters, 1998, vol. 23, no. 22, 1745-1747 (Witzgall et al), and Patil et al (US Patent No. 5,907,333). See the teachings of each reference in paragraph 4 above. The photoresist such as SU-8 taught in

Lee at al can be used in a formation of thick layer and achieve high resolution. Therefore, it would have been obvious to worker of ordinary skill in the art to select the SU-8 in the process of forming 3-D structure claimed in '653 patent for same reason and thereby provide an invention as claimed.

Response to Arguments

5. Applicant's arguments filed on April 29, 2004 have been fully considered but they are not persuasive for the same reasons provided in the Final Office Action on November 30, 2004. The newly amended claims submitted on May 3, 2004 recited "a second component which is an photoacid generator" and the "photosensitive film having thickness 10 to 100 nm". The photoacid generator such as onium salt has been known as photointiator for photosensitive material having an epoxy group such as disclosed in Lee et al and Patil et al. The use of photosensitive layer having thickness of 50 and 100 microns in the process for forming 3-D periodic structure within the scope 10 to 100 nm is exemplified in WO'439, on page 11, lines 14, 22. Therefore, It would have been obvious to the worker of ordinary skill in the art at the time the invention was made to use the photosensitive composition known in either Lee al or Patil et al in the process for forming 3-D periodic structure taught in WO'439 with a reasonable expectation of success. In the absence of showing the criticality of the number of crosslinkable group per molecule claimed in the present claimed invention, the invention as claimed would have been found prima facie obvious to the worker of ordinary skill in the art. The argument with to the three key elements is not persuasive since such property would be inherent to the photosensitive resin taught in the applied prior art of record such as Lee et al or Patil et al. The applicants appears to argue the applied prior art, Lee et al and Patil et al, individually. However,

one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In the response on September 7, 2004 . The applicants first argue that "the photonic crystal material produced in accordance with the presently claimed method is a holographically defined photonic crystal structure having uniform- 3-dimensional periodicity following exposure to an interference pattern generated by coherent interference of UV laser radiation. The achievement of technical advantages, by using a photosensitive material as defined in present claim 1 such as the resin SU-8, is neither taught nor foreshadowed in the references relied on by the Examiner. Thus the references do not make it obvious to one skilled in the art that an Su-8-containing resist would be suitable for making photonic crystal structures having the above-mentioned properties."

It is the Examiner's position that the claimed invention would have been found prima facie obvious for the reason set forth in the office action above. The claimed invention is not related to "the method is a holographically defined photonic crystal structure having uniform- 3-dimensional periodicity following exposure to an interference pattern generated by coherent interference of UV laser radiation" asserted by the applicants. See the process in claim 1 which disclosed that "exposing a photosensitive material to an interference pattern of electromagnetic radiation whereby the exposure through the material varies in accordance with the spatially varying intensity created by the interference to produce a three dimensional periodic variation". This steps is taught is taught in the WO'439 on page 3, lines 21-26. The issue in this case is whether the worker of ordinary skill in the art would have selected a photosensitive material in

this process to form a 3-dimentional pattern by selecting a photosensitive material possessing an average number of cross-linkable groups per molecule of at least 3 with an equivalent weight per crosslinkable group of at most 1000. The WO'319 on page 13, lines 18-33 to page 14, lines 1-25 discloses as how to select the photosensitive material including acrylate negative photoresist; a material with a high density of photochemically induced cross-liking which is rendered relatively insoluble and is retained during development; and the positive photoresist based An alternative materials system is a positive photoresist based on a copolymer of p-hydroxystyrene and t-butyl acrylate. WO'439 discloses different types of photoresist including the one having cross-liking group. The worker of ordinary skill in the art would have selected the photoresist material taught therein including the material having photochemically induced cross-liking property that have been known and taught in the secondary references with a reasonable expectation of success. The argument with respect to the characteristic of the material is not persuasive since it is not evidenced, and based on the Counsel's assertion. Counsel's arguments cannot take the place of evidence. In re Greenfield, 571 F. 2d 1185, 197 USPQ 227 (CCPA 1978).

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thorl Chea whose telephone number is (571) 272-1328. The examiner can normally be reached on 9 AM-5:30 PM.

7. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on (571)272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tchea tlm
June 20, 2005

Thorl Chea
Primary Examiner
Art Unit 1752